COMPLIMENTS OF THE AUTHOR

Control of Apple Scab

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CONTROL OF APPLE SCAB

Venturea inaequalis (Cke.) Wint.

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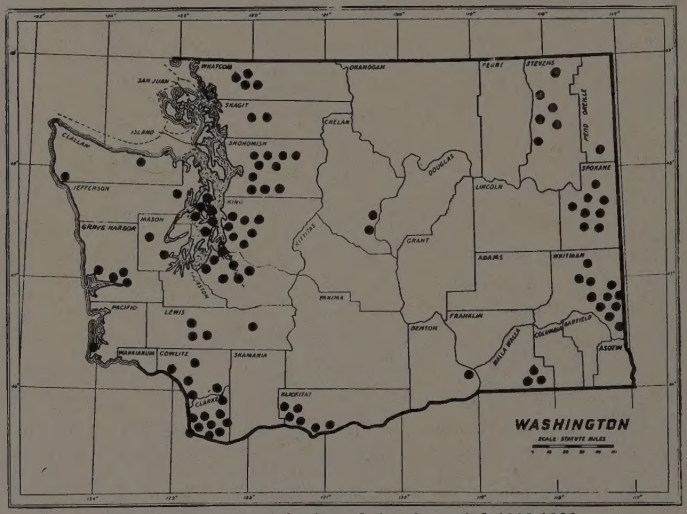
Scab is a disease of the apple that attacks the fruit, leaves, blossom parts and one year-old twigs. The enormous economic loss that is frequently caused by this disease is caused mainly by the attacks on fruit, altho it is never directly responsible for a rot.



Record occurences of Apple scab for the period 1913-1922.

Occurrence of Scab in Washington: Apple scab occurs almost yearly in severe form in the coast areas west of the Cascade Mountains. In central Washington it has been found occasionally in a few abandoned orchards in the Wenatchee district, but has not been reported from the Yakima Valley. In the extreme eastern portions of the State the severity of the disease fluctuates from year to year.

Symptoms: Early spring infections usually occur first on the blossoms and newly formed fruit, as definite circular spots of a brown or black color. As the spots increase in size the outer skin

of the fruit ruptures and forms a whitish band around the more or less velvety, black or brown appearing lesion. With the growth of of the fruit the scab lesions also slowly increase in size causing the central older part to become bare and brown with a corky appearance. If the infection is very severe the lesions often fuse and cause a cracking of the fruit.

The lesions on the blossoms usually occur on the pedicels, calyx or young fruits about the time the petals fall. Scab lesions have even been found to occur on the petals.

The lesions on the leaves are likely to appear first in early spring on the under side as definite circular spots of a brownish or gray color and later changing to an olive green or nearly black. As the disease develops some of the leaves fall; later in the season the leaves not affected sufficiently to fall from the trees may show a thickening of diseased spots; the brown velvety surface becomes smooth and dull and occasionally dead areas of leaf tissue drop out leaving irregular holes in the leaves. If the infection is severe it causes the leaf area to be somewhat curled and distorted.

In still other cases the affected trees show a yellowing of the foliage and partial defoliation may occur. Occasionally the diseased leaves are mottled with yellow, brown and green areas, and in such cases the scab lesions may be found on the green areas. While the early lesions are frequently on the under sides of the leaves they appear on both sides later in the season.

The characteristic scab lesions are also found on one-year old twigs and present a similar appearance to the lesions on the fruit, having a central spore surface bordered by an uplifted epidermis. The spores soon disappear leaving the bark with a scaly appearance due to its peeling off in flakes.

Effects: The most serious effects of scab are due to the attacks on blossom parts or young fruits, often causing a complete blighting or dropping of the fruits while still very young. It is not uncommon for orchardists to allow this phase of scab injury to escape their notice and attribute this failure to set fruit to adverse climatic conditions or cold rains or frosts during the blossom period.

It is not uncommon for the size of the fruit to be lowered due to scab infection and even if the fruit should reach normal size the lesions disfigure it rendering it unfit for the best markets. In severe

cases scab causes cracks, extending deep into the pulp. In the fall scab often causes a premature dropping of fruit. Late fall infections sometimes occur which cause small spots of a dense black color on the fruit. These remain small and therefore this phase of the disease is sometimes designated as "pin-point scab."

When placed in storage scabbed apples do not keep well since the breaks in the skin allow excessive evaporation thus causing the apples to shrink and shrivel. Deep cracks and lesions offer an easy means for rot-producing fungi to enter and destroy the fruit. Under certain conditions new infections occur on fruit in storage and cause considerable loss.

Because of a reduction in the size of the leaf, killing of the disease spots and the defoliation of the tree the manufacturing ablity of the plant is reduced. This condition causes a retardation of normal growth and the formation of no fruit buds.

Losses from Scab: Losses from scab are of three sources: (1) The reduction of the total yield of fruit; (2) a lowering of the quality of the product which means a lowering of the financial return, and (3) the increased cost of production due to the necessity of spraying and of sorting the product.

THE CAUSE OF APPLE SCAB

Apple scab is caused by a fungus known to science as **Venturia inaequalis** (Cke.) Wint, which lives as a parasite on the blossoms, twigs, leaves and fruit of the apple tree, and completes its life history as a saprophyte, during the fall and winter on the dead leaves.

During the parasite stage on the blossoms, twigs, leaves and fruit, single-celled summer spores, (conidia) are produced which are the means of spreading infection during the summer.

The fungus lives over winter in the dead leaves and early in the spring minute black spots or pimples, scarcely visible to the naked eye appear on the surface of the leaves. Two-celled winter spores are formed in these pimples or sacs which explode during warm spring rains and are carried by the wind to apple trees and are the source of spring infections.

The period of expelling winter spores varies in different parts of the country. Under Western Washington conditions, ascospore discharge begins late in February or early in March and continues

for about three months. In Eastern Washington the ascospore discharge does not begin before the middle of March or first of April and does not last much more than one month.

Predisposing Factors: Climatic factors determine the severity of scab infection. In general, cool moist weather is favorable for scab infection while high temperatures, although accompanied by moist weather, are unfavorable. Any set of conditions that help retain moisture following a rain are favorable for scab infection.

Normal apple and series affected with scab showing spotting, deforming and reduction in size of fruit.

Winds following rains cause the moisture to evaporate rapidly and are therefore unfavorable for infection. Trees in low pockets are more subject to scab than those on higher land where air drainage is good and evaporation more rapid.

Host Relations and Varietal Resistance: The fungus causing apple scab is found only on apple varieties. Scab of the hawthorn and of the pear are caused by two other distinct species of fungi. No varieties of apples are immune to scab. Certain varieties vary in their susceptibility to scab from year to year. The Baldwin is usually listed as immune to scab, but infection up to 98 per cent has been reported on this variety.

CONTROLLING APPLE SCAB

While spraying is the principle means of controlling scab, certain other practices are useful, when used in combination with fungicides.

Planting Practices: Scab sprays are timed with reference to the blossoming periods, therefore it is advisable to plant solid blocks of certain varieties, rather than mixed plantings.

Even in small orchards it is not advisable to mix varieties since it is then more difficult to do the spraying.

Sanitary Measures: Experience in many sections shows that scab is most severe in neglected orchards. If the trees have not been properly pruned so that there is a dense growth of wool and foliage, the sunlight is excluded and air circulation is obstructed, thus retarding evaporation and producing favorable conditions for spore germination and for infection.

Since the scab fungus winters over in the dead fallen leaves any means consistant with horticultural practice whereby the dead leaves are destroyed or buried in the soil is to be recommended and will increase the effectiveness of spraying by reducing the source of infection.

The Use of Fungicides: Fungicides are successfully applied either by spraying or by dusting, but spraying is still more generally practiced. The time of spraying or dusting is determined by the life history of the fungus and should be as follows: (1) Soon after the cluster buds have separated but before the petals have expanded. This is known as the "pink spray" and is the most important application since it is designed to prevent primary infection. The effective period for this application varies from one to three days, consequently delay at this time may mean failure or only partial control of the disease. (2) Just as 2/3 or 3/4 of the petals have fallen the "calyx spray" should be given, and it can be applied effectively during a two to five day period. (3) Ten days or two weeks later the next spray is applied. (4) Later applications at similar intervals may sometimes be necessary. In regions like Western Washington and the White Salmon district there is evidence favoring the necessity of a delayed dormant spray just as the leaf buds are starting to open.

No set rule can be used for syraying in all regions, so conditions in each locality must be studied and local spraying schedules made

according to the period of winter spore discharge. In Eastern Washington two applications of spray are sufficient, while on the coast it is frequently necessary to apply three or four.

The spraying schedules now recommended are as follows:

(a) Lime-sulphur,* 1 gallon of the concentrated solution testing 32° Beaume to 30-40 gallons of water or the equivalent with lead arsenate (1 pound powdered; 2 pounds paste) when control of chewing insects is also desired. This is the parctice most generally followed.

Within the last few years lime-sulphur has been placed on the market in dry or powdered form which is prepared for use by dissolving in water.

Extensive experiments at the Michigan and Oregon Experiment stations have shown that dry lime-sulphur is not so effective as the standard lime-sulphur. It was found in Oregon that it took 200 pounds of dry lime sulphur to equal one 50 gallon barrel of concentrated liquid. This makes the dry product more expensive.

(b) Bordeaux* 3-3-50 or 4-4-50 formula for the "pink" spray and lime-sulphur for the later applications. This has in some cases given better control than lime-sulphur for all application.

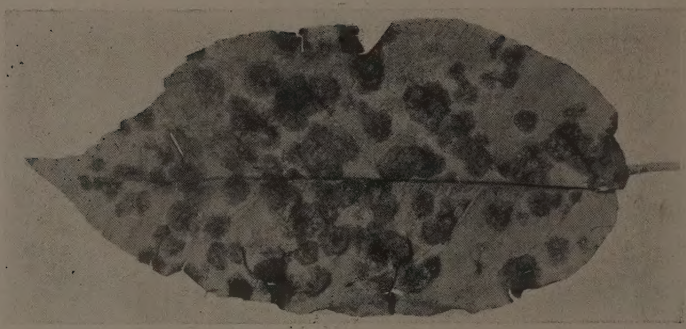
(c) Lime-sulphur for the first application, or until the advent of hot weather (to June or July) and Bordeaux or other copper fungicide for later applications. This practice is designed to elminate the burning of fruit which results from lime-sulphur when applied during the period of high temperature and intense sunlight.

(d) Bordeaux 3-10-50 for the semi-dormant spray and 2-10-50 for later sprays. This formula is based on the experience in Nova Scotia where lime-sulphur injury must be prevented.

*See Extension Bulletin 41 for instruction how to prepare lime-sulphur and Bordeaux mixture.

Acknowledgement

Pictures of Apple Scab appearing on the front and back pages of this bulletin, were used thru the courtesy of the New York Experiment Station at Cornell University.



Apple scab disease on leaves.

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Apple scab showing on pedicles of blossoms.